Scientific Inquiry

PS-1 The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

PS-1.8 Compare the processes of scientific investigation and technological design.
Taxonomy Level: 2.6-B Understand Conceptual Knowledge

Key Concepts:
Science, Technology
Scientific investigation
Technological design

Previous/Future knowledge: In the 5th grade and 6th grades, students used technological design process (5-1.7) and (6-1.3), and from the 4th grade (4-1.3) on up, students have summarized characteristics of controlled scientific investigations. In Physical Science (PS-1.7), students evaluated technological designs or products. Building on this knowledge, students will compare processes of scientific investigations and technological designs. Scientific investigations and technological design will continue to be developed in biology.

It is essential for students to

- Understand that *science* is a process of inquiry that searches for relationships that explain and predict the physical, living and designed world.
- Understand that *technology* is the application of scientific discoveries to meet human needs and goals through the development of products and processes.
- Understand that the processes of *scientific investigation* are followed to determine the relationship between an independent and dependent variable described by a hypothesis. The results of scientific investigations can advance science knowledge.
- Understand that the processes of *technological design* are followed to design products or processes to meet specified needs. The results of technological designs can advance standard of living in societies.
- Understand that, in general, the field of engineering is responsible for technological designs or products by applying science to make products or design processes that meet specific needs of mankind.
- The process of controlled scientific investigations:
  - Asks questions about the natural world;
  - Forms hypotheses to suggest a relationship between dependent and independent variables;
  - Investigates the relationships between the dependent and independent variables;
  - Analyzes the data from investigations and draws conclusions as to whether or not the hypothesis was supported.
- The technological design process is used to design products and processes that people can use. The process may involve:
  - A problem or need is identified
  - A solution is designed to meet the need or solve the problem identified.
  - The solution or product is developed and tested.
  - The results of the implementation are analyzed to determine how well the solution or product successfully solved the problem or met the need.

Scientific Inquiry

PS-1 The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Some ways that the two processes might be compared:

Scientific Investigation	Technological Design
Identifies a problem – asks a question	Identifies a problem or need
Researches related information	Researches related information
Designs an investigation or experiment	Designs a process or a product
Conducts the investigation or experiment – repeated trials	Implements the design or the process – repeated testing
Analyzes the results	Analyzes the results
Evaluates the conclusion – did the results refute or verify the hypothesis	Evaluates the process or product – did it meet the criteria
Communicates the findings	Communicates the product or process

It is not essential that students

- Distinguish which field of engineering is associated with specific technological designs.

Assessment Guidelines:

The objective of this indicator is to *compare* the processes of scientific investigation and technological design; therefore, the major focus of assessment should be to detect the similarities and differences in the processes of controlled scientific investigation and technological design.

In addition to *compare*, students should be able to:

- *Exemplify* the processes of scientific investigation and technological design;
- *Classify* a process as either part of a scientific investigation or technological design given a description of the steps;
- *Summarize* steps that may be part of each process;
- *Illustrate* the processes of scientific investigation and/or technological design in words, diagrams or pictures;
- *Recognize* each process based on whether it advances scientific knowledge or designs products or processes that meet specific needs of mankind.